AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

1-11. (Canceled)

12. (Previously Presented) A system for hemodynamic simulation, the system comprising:

a fluid;

a vessel through which the fluid may be urged;

a chamber in which the vessel is received, the chamber including a means for controlling pressure;

a reservoir for retaining the fluid;

a plurality of pumps in fluid communication with the fluid, one of the pumps urging the fluid through the vessel; and

a means for controlling the pumps, wherein the means for controlling the pumps comprises a motor, a cam, and a means for linking the pumps, wherein the pumps are operatively connected to the means for controlling the pumps.

13. (Previously Presented) The system as described in claim 12, wherein the means for linking the pumps is adjustable, and wherein the pumps are out of phase with each other.

14. (Previously Presented) The system as described in claim 13, wherein the pumps are out of phase with each other by between 10 and 360 degrees.

15. (Previously Presented) The system as described in claim 14, wherein the pumps are out of phase with each other by between 90 and 180 degrees.

16. (Currently Amended) A system for hemodynamic simulation, the system comprising:

a fluid;

a vessel through which the fluid may be urged;

a chamber in which the vessel is received, the chamber including a means for controlling pressure;

a reservoir for retaining the fluid;

a plurality of pumps in fluid communication with the fluid, one of the pumps urging the fluid through the vessel; and

a means for controlling the pumps ~~The system as described in claim 12~~, wherein the means for controlling the pumps is selected from the group consisting of a cam mechanism; a multi-bar linkage mechanism; a solenoid; a stepper motor; an electric motor; a linear ball actuator; a belt-driven actuator; and a chain-driven actuator.

17. (Previously Presented) The system as described in claim 12, further comprising a third pump, the third pump being connected to the chamber, and wherein when the means for controlling pressure is applied to the chamber, pressure is exerted on the vessel.

18. (Previously Presented) The system as described in claim 17, further comprising a means for adjusting the downstream flow of the fluid between the vessel and the reservoir.

19. (Previously Presented) The system as described in claim 18, further comprising a steady flow pump, the steady flow pump being positioned between the reservoir and one of the pumps.

20. (Previously Presented) The system as described in claim 19, further comprising a means for filtering noise, the means for filtering noise being positioned between the steady flow pump and the vessel.

21. (Previously Presented) The system as descried in claim 16, wherein the means for controlling the pumps further comprises a computer system.

22. (Previously Presented) The system as described in claim 12, wherein the vessel is chosen from the group consisting of mammalian blood vessels; models of mammalian blood vessels; endothelial cells; osteocytes; chondrocytes; and muscle cells.

23. (Previously Presented) The system as described in claim 12, wherein the plurality of pumps comprises:

an upstream pump in fluid communication with the fluid, the upstream pump urging the fluid through the vessel in a pushing manner; and

a downstream pump in fluid communication with the fluid, the downstream pump being downstream of said upstream pump, the downstream pump urging the fluid through the vessel in a pulling manner.

24. (Previously Presented) The system as described in claim 12, wherein the plurality of pumps comprises:

a pair of upstream pumps in fluid communication with the fluid.

25. (Previously Presented) The system as described in claim 12, wherein the plurality of pumps comprises:

an upstream pump in fluid communication with the fluid, the upstream pump urging the fluid through the vessel in a pushing manner; and

an external pump, the external pump being operatively connected to the chamber, wherein when the means for controlling pressure is applied to the chamber, pressure is exerted on the vessel.

26. (Previously Presented) The system as described in claim 12, wherein the plurality of pumps comprises:

a downstream pump in fluid communication with the fluid, the downstream pump urging the fluid through the vessel; and

an external pump, the external pump being operatively connected to the chamber, wherein the means for controlling pressure is applied to the chamber, pressure is exerted on the vessel.

27. (Previously Presented) A system for hemodynamic simulation, the system comprising:

a fluid;

a vessel through which the fluid may be urged;

a chamber in which the vessel is received, the chamber including a means for controlling pressure;

a reservoir for retaining the fluid;

a plurality of pumps in fluid communication with the fluid, one of the pumps urging the fluid through the vessel; and

a means for controlling the pumps comprising a motor, a cam, and a means for linking the pumps with each other, the pumps being operatively connected with the means for controlling the pumps, the means for linking the pumps being adjustable, the pumps being out of phase with each other.

28. (Previously Presented) The system as described in claim 27, wherein the plurality of pumps comprise:

an upstream pump in fluid communication with the fluid, the upstream pump urging the fluid through the vessel in a pushing manner; and

a downstream pump in fluid communication with the fluid, the downstream pump being downstream of the upstream pump, the downstream pump urging the fluid through the vessel in a pulling manner;

a third pump operatively connected to the means for controlling the pumps, the third pump being connected to the chamber, and wherein when the means for controlling pressure is applied to the chamber, pressure is exerted on the vessel.

29. (Previously Presented) The system as described in claim 28, wherein the vessel is chosen from the group consisting of mammalian blood vessels; models of mammalian blood vessels; endothelial cells; osteocytes; chondrocytes; and muscle cells.

30. (Previously Presented) The system as described in claim 27, wherein the plurality of pumps comprise:

a pair of upstream pumps in fluid communication with the fluid.

31. (Previously Presented) The system as described in claim 27, wherein the plurality of pumps comprise:

an upstream pump in fluid communication with the fluid, the upstream pump urging the fluid through the vessel in a pushing manner; and

an external pump, the external pump being operatively connected to the chamber, wherein when the means for controlling pressure is applied to the chamber, pressure is exerted on the vessel.

32. (Previously Presented) The system as described in claim 27, wherein the plurality of pumps comprise:

a downstream pump in fluid communication with the fluid; the downstream pump urging the fluid through the vessel in a pulling manner;

an external pump, the external pump being operatively connected to the chamber, wherein when the means for controlling pressure is applied to the chamber, pressure is exerted on the vessel.

33. (Cancelled)

34. (Previously Presented) A method for simulating biomechanical stimuli, the method comprising the steps of:

providing a fluid;

providing a vessel through which the fluid may be urged;

providing a chamber for receiving the vessel therein, the chamber further including a means for controlling pressure, wherein said chamber is connected to a pump;

providing an upstream pump in fluid communication with the fluid, the upstream pump urging the fluid through the vessel in a pushing manner;

providing a downstream pump in fluid communication with the fluid, the downstream pump urging the fluid through the vessel in a pulling manner.

35. (Previously Presented) The method as described in claim 34, further comprising the step of applying the means for controlling pressure to the chamber, thereby exerting pressure on the vessel.

36. (Previously Presented) The method as described in claim 34, wherein the vessel is chosen from the group consisting of mammalian blood vessels; models of mammalian blood vessels; endothelial cells; osteocytes; chondrocytes; and muscle cells.

37. (Previously Presented) The method as described in claim 35, further comprising the step of providing a means for controlling the pumps, wherein the upstream pump and the downstream pump are operatively connected with the means for controlling the pumps.

38. (Previously Presented) The method as described in claim 37, wherein the means for controlling the pumps comprises a motor, a cam, and a means for linking the upstream pump with the downstream pump.

39. (Previously Presented) The method as described in claim 38, wherein the means for linking the upstream pump and the downstream pump is adjustable, and wherein the upstream pump and the downstream pump are out of phase with each other.

40. (Previously Presented) The method as described in claim 39, wherein the upstream pump and the downstream pump are out of phase with each other by between 10 and 360 degrees.

41. (Previously Presented) The method as described in claim 40, wherein the upstream pump and the downstream pump are out of phase with each other by between 90 and 180 degrees.

42. (Currently Amended) The method as described in claim ~~41~~ 37, wherein the means for controlling the pumps is selected from the group consisting of a cam mechanism, a multi-bar linkage mechanism; a solenoid; a stepper motor; an electric motor; a linear ball actuator; a belt-driven actuator; and a chain driven actuator.

43. (Previously Presented) The method as described in claim 42, further comprising the step of providing a reservoir for retaining the fluid, the reservoir being in fluid communication with the vessel.

44. (Previously Presented) The method as described in claim 43, further comprising the step of providing a means for adjusting the downstream flow of the fluid between the vessel and the reservoir.

45. (Previously Presented) The method as described in claim 44, further comprising the step of providing a steady flow pump, the steady flow pump being positioned between the reservoir and the upstream pump.

46. (Previously Presented) The method as described in claim 45, further comprising the step of providing a means for filtering noise, the means for filtering noise being positioned between the steady flow pump and the vessel.

47. (Previously Presented) The method as described in claim 46, wherein the means for controlling the pumps further comprises a computer system.

48. (Previously Presented) The method as described in claim 34, wherein the biomechanical stimuli are chosen from the group consisting of wall shear stress, circumferential strain, pulsatile pressure, transmural pressure, and biologically active agents.

49. (Previously Presented) A method for hemodynamic simulation, the method comprising the steps of:

providing a fluid;

providing a vessel through which the fluid may be urged;

providing a chamber in which the vessel is received, the chamber further including a means for controlling pressure;

providing a reservoir for retaining the fluid;

providing a plurality of pumps in fluid communication with the fluid, wherein one of said pumps urges the fluid through the vessel; and

providing a means for controlling the pumps, comprising a motor, a cam, and a means for linking the pumps with each other, the pumps being operatively connected with the means for controlling the pumps, the means for linking the pumps being adjustable, the pumps being out of phase with each other.

50. (Previously Presented) The system described in claim 49, wherein the vessel is chosen from the group consisting of mammalian blood vessels, models of mammalian blood vessels; endothelial cells; osteocytes; chondrocytes; and muscle cells.

51. (Previously Presented) The method as described in claim 49, further comprising:

providing an upstream pump in fluid communication with the fluid; the upstream pump urging the fluid through the vessel in a pushing manner; and

providing a downstream pump in fluid communication with the fluid, the downstream pump being downstream of the upstream pump, the downstream pump urging the fluid through the vessel in a pulling manner; and

providing a third pump, the third pump operatively connected to the means for controlling the pumps, the third pump being connected to the chamber, and wherein when the means for controlling the pressure is applied to the chamber, pressure is exerted on the vessel.

52. (Previously Presented) The method as described in claim 49, further comprising: providing a pair of upstream pumps in fluid communication with the fluid.

53. (Previously Presented) The method as descried in claim 49, further comprising:

providing an upstream pump in fluid communication with the fluid, the upstream pump urging the fluid through the vessel in a pushing manner; and

providing an external pump the external pump being operatively connected to the chamber, wherein when the means for controlling pressure is applied to the chamber, pressure is exerted on the vessel.

54. (Previously Presented) The method as described in claim 49, further comprising:

providing a downstream pump in fluid communication with the fluid, the downstream pump urging the fluid through the vessel in a pulling manner; and

providing an external pump, the external pump being operatively connected to the chamber, wherein when the means for controlling pressure is applied to the chamber, pressure is exerted on the vessel.

55. (Previously Presented) The system of claim 12, wherein the fluid comprises tissue culture medium, blood, physiological saline solution, or other buffered solution.

56. (Previously Presented) The system of claim 27, wherein the fluid comprises tissue culture medium, blood, physiological saline solution, or other buffered solution.

57. (Previously Presented) The method of claim 34, wherein the fluid comprises tissue culture medium, blood, physiological saline solution, or other buffered solution.

58. (Previously Presented) A system for hemodynamic simulation, the system comprising:

a vessel through which fluid may be urged;

a chamber in which the vessel may be received, the chamber including a means for controlling pressure within the chamber and being connected to a pump;

a reservoir suitable for retaining a fluid; and

a plurality of pumps, one of said pumps being suitable for urging fluid through the vessel, wherein said pumps are operatively connected to the means for controlling the pumps, and wherein the means for controlling the pumps comprises a motor, a cam, and a means for linking the pumps.